REC'D 6/3/10

"City of Champions"

DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

Michael L. Thoreson
COMMISSIONER

June 1, 2010

CERTIFIED MAIL 7002 2410 0001 8493 8605

I. Andrew Goldberg
Assistant Attorney General
Massachusetts Office of the Attorney General
One Ashburton Place
18th Floor
Boston, MA 02108

Subject: **Brockton, Massachusetts**
Wastewater Collection/Treatment Facility
Consent Decree Civil Action Case No. 1:06-cv-11334-NMG

Supplemental Environmental Project - Comprehensive Receiving Water Assessment

Dear Mr. Goldberg:

The City of Brockton is submitting this updated Draft Scope of Services in compliance with the subject Consent Decree requirement for the Supplemental Environmental Project (SEP): "Comprehensive Receiving Water Assessment (the Assessment)."

Specifically, Appendix A of the Consent Decree stipulates that the City shall submit for approval to EPA and Mass DEP a draft Scope of Services for the Assessment, including a schedule for completion of the Assessment and identification of the consultant the City intends to use to conduct the Assessment. The Assessment shall include two low flow surveys conducted over a period not to exceed three years. Low flow shall be defined as flows equal to the August median flow or lower. The Assessment shall include chemical and biological sampling of approximately 10 stations in locations upstream of the Brockton discharge to the confluence of the Matfield and Town Rivers, including all major tributaries, and reporting the results of the chemical and biological sampling.

The draft scope of work was submitted under cover letter dated February 26, 2009. At the time is was understood that stream flows were too high to implement the sampling program, so stream sampling would be anticipated for 2010 and 2011 to meet the reporting milestone indicated in the Consent Decree. The updated chemical and biological sampling programs, scheduling details, and cost considerations are described further below. Massachusetts DEP will require a Quality Assurance Project Plan (QAPP) be developed and maintained for the SEP work. Approval of the QAPP is required from both USEPA and MADEP prior to commencement of any field work.

CITY HALL, 45 SCHOOL STREET, BROCKTON, MASSACHUSETTS 02301
TEL: (508) 580-7135 FAX: (508) 580-7169 Email: mthoreson@ci.brockton.ma.us

Sampling Program Goals:

Chemical and biological sampling will be performed to provide data that could be used by MADEP to support an Aquatic Life Use status assessment. Within the $80,000 upper limit budget constraint imposed by the Consent Decree, appropriate analytes, analyses, and sampling locations will be selected, and approved by MADEP and EPA, to help assess improvements to water quality that may have resulted from recent upgrades at the Brockton AWRF. Sampling will occur if flows are at or below August median low flows. One round of sampling is scheduled for August 2010, and one round is scheduled for August 2011. Sampling may occur in the months of July or September if the low flow criteria are reached. All sample collection and data submittals will be as outlined in MADEP guidance CN#0.71 Guidelines for Submittal of Data for potential use in DWM's Waterbody Assessments and TMDLs (Clean Water Act, Sections 305(b) and 303(d)).

Quality Assurance Project Plan (QAPP)

Sampling will not be performed unless MADEP and EPA have approved a QAPP. The QAPP will address field sampling and analysis of water quality parameters, as needed (this includes biological surveys). The University of Massachusetts Dartmouth's Coastal Systems Program Analytical Facility at the School of Marine Science and Technology (SMAST), or other laboratory contracted to perform analyses will provide all laboratory standard operating procedures (SOPs) and electronic Quality Assurance Plans (QAPs), and relevant reporting limits and method detection limit information, select appropriate sample containers, identify field preservation procedures, and will provide tabulated data results.

The draft QAPP and Sampling and Analysis Plan will be completed and distributed to major project participants and to DEP and EPA for review and approval. The completed The QAPP will summarize basically what the project entails (i.e., who, what, when, where, why, and how data collection will occur. Project sampling will include appropriate field and laboratory quality control samples at a rate of at least 10% (1 quality control sample per 10 field samples) to assess general data quality issues, as required by the project QAPP.

Project reporting will include raw data, QC data, and important metadata. All project data, metadata, and quality control data will be critically reviewed to look for problems that may compromise data usability. The draft QAPP is attached to this letter.

Sampling Locations:

In accordance with the requirements of the SEP, the attached map figure identifies the proposed 6-10 sampling locations, from upstream of the Brockton Advanced Water Reclamation Facility (AWRF) to the confluence of the Matfield and Town Rivers. Final sampling locations will be selected in consultation with MADEP and EPA for determining impacts that may be associated with the Brockton AWRF discharge. Stations 1 to 6 are suggested for prioritization under the reduced the number of sampling locations to meet budget constraints.

The attached table provides additional detail for each location, including watercourse identification, whether or not the location was included in previous DEP sampling/testing programs, sampling location and access information, and the nearest confluence of the river system. As noted in the table, eight of the ten locations proposed in February 2009 were included in previous chemical and biological testing by the MA DEP Division of Watershed Management (DWM) as detailed in the report 2006 DWM Environmental Monitoring Overview (CN277.0).

Changes to those proposed locations, in response to input from stakeholders, may be summarized as follows:

- The Edson Brook Station will be replaced by a suitable station down gradient of but close to the Brockton AWRF discharge on the Salisbury Plain River.
- Proposed Station 8 has been moved to the nearest road crossing above the confluence with the Satucket River.
- Proposed Station 10 has been moved to the Town River above the confluence with the Matfield River.

Specific monitoring sites will be selected in advance of sampling, targeting wadeable (<2-3 feet low-flow depth) stream sections that might have riffle, run, and pool components and a relatively intact riparian buffer with a tree canopy. Ideally, for biological surveys, the substrate would be a mix of sand, gravel, and cobble with some accumulations of coarse woody debris and finer detritus. Monitoring sites must also be accessible and will be located near road crossings or other access points.

Chemical Sampling Program:

The chemical sampling program will include sampling and lab testing for dissolved oxygen levels, pH, alkalinity, total hardness, turbidity, specific conductance, total dissolved solids, nitrogen series (nitrate, nitrite, ammonia, and total kjeldahl), chlorophyll A, and total and dissolved Orthophosphate. Samples will be taken at each of the sampling locations for each of the noted chemical tests, and transported to a testing lab. The University of Massachusetts - Dartmouth School of Marine Science And Technology (SMAST) Coastal Systems Program, Analytical Facility Laboratory or a similar facility will be utilized to perform the lab testing for all water samples under this program. CDM will coordinate the program, collect and deliver the samples, and review and report results. It is estimated that each round of the chemical sampling will include confirmation of sampling locations, compilation of precipitation and stream flow data, and approximately one day of field work for two, 2-person teams, compilation of all testing results, and a "Field Completion Memo" summarizing the procedures and results.

Biological Sampling Program:

The biological sampling program will include macro invertebrates and habitat assessment (using USEPA rapid bio-monitoring/bio-assessment protocol, or RBP III), periphyton assessment (analysis of micro algae, bacteria, and/or fungi on submerged substrates) and macrophytes analysis (qualitative analysis of vegetation at the sampling site, such as water starwort, waterwort, and pondweed.) MADEP has determined that the periphyton analysis requires only an assessment of percent coverage without identification or biomass determination (e.g., of filamentous algae). Percent coverage is used as an adjunct to other chemical and biological indicators for indication of nutrient enrichment; it is not currently a primary indicator in Aquatic Life Use assessment.

CDM will coordinate the program, perform the field work, perform macro-invertebrate classifications (i.e., identification to family/genus), and review and report results. It is estimated that each biological survey round will include confirmation of sampling locations, compilation of precipitation and stream flow data, five days of field work for one, 3-person team, in-house lab work for identification to family/genus, compilation of all sampling and analysis, and a "Field Completion Memo" summarizing the procedures and results.

Fish community surveys would require 1-3 days for one additional 3-person team, depending on the number of sites where the survey would be performed, so due to the costs involved and reduced benefit to the program as compared to the other assessments; they are not intended to be included. As an alternative, full biological surveys may be performed for only one year of the SEP to meet budget constraints. Data submittals will be prepared according to MADEP guidance CN#0.71 Guidelines for Submittal of Data for potential use in DWM's Waterbody Assessments and TMDLs (Clean Water Act, Sections 305(b) and 303(d)).

Proposed Schedule:

One round of sampling is scheduled for 2010, and one round is scheduled for 2011.
To comply with the requirement to sample during "low flow" conditions, sampling will be targeted for August of each sampling year; however, sampling may occur in the months of July to September in appropriate low-flow conditions. Precipitation levels (via NOAA) and the USGS stream gage level on the Taunton River shall be monitored prior to each year's sampling program, and will be documented for the five days prior to sampling. Following completion of the sampling program and field completion memos, the SEP Completion Report shall be submitted by March 31, 2012, as stipulated in the SEP. The schedule is also attached.

Cost Considerations:

The SEP includes a requirement that the City shall expend a total of no more than $80,000 toward the cost of the Assessment. Further, the City shall include documentation of the expenditures made in connection with the Assessment as part of the SEP Completion Report, which shall be submitted by March 31, 2012.

It has been acknowledged by EPA that to complete the full suite of chemical and biological sampling programs at all ten locations, plus all reporting, would require significantly more than the $80,000 upper limit. In order to cost effectively complete the final scope of work while limiting additional costs to the City beyond the requirement of the SEP, the City of Brockton may utilize City personnel to assist CDM staff with field work where possible. Additional cost savings will be evaluated throughout the program to ensure that the final Scope of Work is properly completed in a cost effective manner.

Within the budget constraints, CDM will work with Massachusetts DEP to choose the analytes, analyses, and sampling locations best suited to help assess improvements in water quality that may have resulted from recent upgrades at the Brockton AWRF. The recommended program to minimize expenditures above the $80,000 limit is Alternative 3, in which both chemical sampling and biological surveys are performed at 6 locations in each year. Fish surveys would not be performed. As an alternative, chemical sampling could be performed at 10 locations in each year, with biological surveys (exclusive of fish surveys) at each of the 10 stations for one year only (alternative 1A below). Fish surveys will not be performed as their benefit to the program is limited compared to the other sampling methods. A breakdown of costs for the options considered follows:

Full Program

Estimated
Program Total: $163,308

Biological Sampling at 10 sites: macro-invertebrates & habitat (RBP III), periphyton, macrophytes
WITH Fish Population Sampling at 10 sites: 3 person team, 3.5 days, 2 Biodrawversity, 1 CDM

Biological sampling: 2 persons x 5 days (2 sites per day)
Chemical sampling at 10 sites: 4 persons x 1 10-hr day

Alternative 1: No Fish Population Survey

Estimated Program Total: $116,814

Biological Sampling at 10 sites: macro-invertebrates & habitat (RBP III), periphyton, macrophytes
No Fish Population Survey
Biological sampling: 2 persons x 5 days (2 sites per day)
Chemical sampling at 10 sites: 4 persons x 1 10-hr day

Alternative 1A (ALTERNATIVE RECOMMENDATION):

Estimated Program Total: $77,457

Biological Sampling at 10 sites: macro-invertebrates & habitat (RBP III), periphyton, macrophytes - YEAR 1 ONLY
No Fish Population Survey
Biological sampling: 2 persons x 5 days (2 sites per day)
Chemical sampling at 10 sites: 4 persons x 1 10-hr day

Alternative 2:

Estimated Program Total: $104,769

Biological Sampling at 6 sites: macro-invertebrates & habitat (RBP III), periphyton, macrophytes - BOTH YEARS
WITH Fish Population Sampling at 3 sites BOTH YEARS: 3 person team, 1 days, 2 Biodrawversity, 1 CDM
Biological sampling: 2 persons x 3 days (2 sites per day)
Chemical sampling at 10 sites: 4 persons x 1 10-hr day

Alternative 2A:

Estimated Program Total: $77,296

Biological Sampling at 6 sites: macro-invertebrates & habitat (RBP III), periphyton, macrophytes - YEAR 1 ONLY

WITH Fish Population Sampling at 6 sites: YEAR 1 ONLY
Biological sampling: 2 persons x 3 days (2 sites per day)
Chemical sampling at 10 sites: 4 persons x 1 10-hr day

Alternative 3: (RECOMMENDED)

Estimated Program Total: $84,447

Biological Sampling at 6 sites: macro-invertebrates & habitat (RBP III), periphyton, macrophytes - YEARS 1 AND 2

No Fish Population Survey

Biological sampling: 2 persons x 3 days (2 sites per day)

Chemical sampling at 6 sites: 2 persons x 1 10-hr day

Certification by Representative of the City:

In accordance with Section 73 of the Consent Decree, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Closing

We trust this information meets your expectations regarding the required scope of work for the Comprehensive Receiving Water Assessment SEP.

Please do not hesitate to contact me at 508-580-7135 regarding any questions or comments on this information.

Sincerely,

Michael L. Thoreson
DPW Commissioner

cc: Chief, Environmental Enforcement Section
Environmental and Natural Resources Division
United States Department of Justice
P.O. Box 7611, Ben Franklin Station
Washington, D.C. 20044

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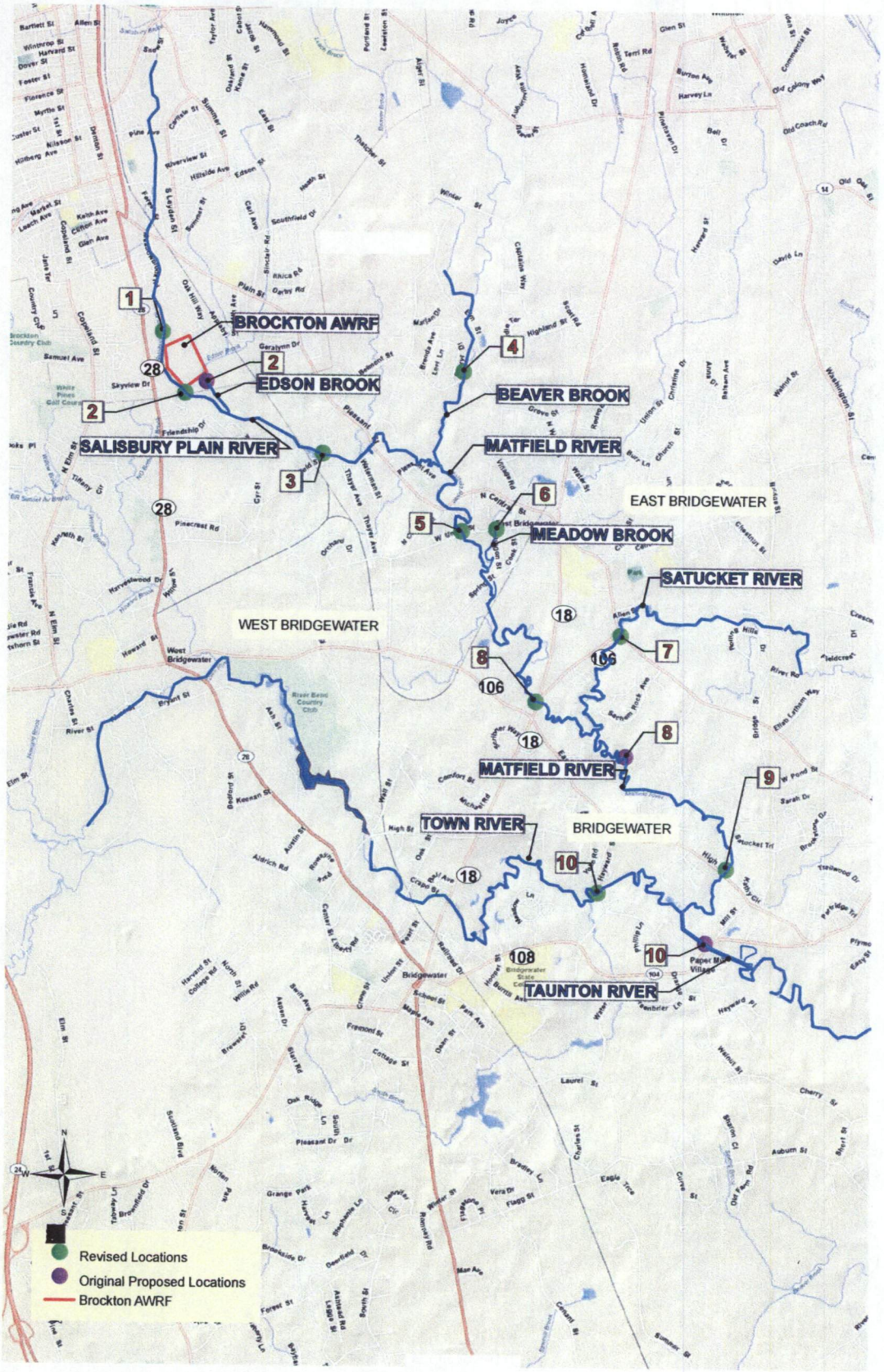

CDM

0.5 0.25 0 0.5 Miles

BROCKTON RECEIVING WATER ASSESSMENT SEP
REVISED PROPOSED SAMPLING LOCATIONS

BROCKTON, MA
5/21/2010

Revised Proposed Sampling Locations, 5/27/2010

Site Number	Watercourse	Previous DEP Sampling Site? **	Comments and Location	Nearest Confluence	Access
1	Salisbury Plain River	Yes - SalPR01	Upstream of Brockton AWRF facility discharge to Salisbury Plain River	Salisbury Plain River and Edson Brook	Sargent's Way
2	Salisbury Plain River	No	Downstream of Brockton AWRF facility discharge to Salisbury Plain River	Salisbury Plain River and Edson Brook	Treatment Plant
3	Salisbury Plain River	Yes - SalPR00	Downstream from Belmont Street, E Bridgewater, MA	Salisbury Plain River and Edson Brook	No good public access, possible private access.
4	Beaver Brook	Yes - BvrBK00	Belmont Street, East Bridgewater, MA	Beaver Brook and Salisbury Plain River	Northeast of Cheryl Drive, near #525Belmont St.
5	Matfield River	Yes - MatR01	West Union Street, Bridgewater, MA	Meadow Brook and Matfield River	300' West of Cross St. on West Union
6	Meadow Brook	Yes - MdwBK00	West Union Street, Bridgewater, MA	Meadow Brook and Matfield River	100' West of Orange St. on West Union
7	Satucket River	Yes - StkR00	Plymouth Street, E Bridgewater, MA	Satucket and Matfield Rivers	100' South of Whtiman St. on Plymouth St.
8	Matfield River	No	Rte 18, E Bridgewater, MA	Satucket and Matfield Rivers	Rte 18
9	Matfield River	Yes - MatR00	High Street, Bridgewater, MA	Matfield and Town Rivers	High Street near #1440 High St.
10	Town River	No	Town River at Hayward St, Bridgewater, MA	Matfield and Town Rivers	Hayward St.

** Per DEP Report: "2006 DWM ENVIRONMENTAL MONITORING OVERVIEW (CN 277.0)"

Anticipated Schedule 2010 - 2011

Activity	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Background data collection and outreach	X	X	X																		
Kickoff meeting with project field team			X												X						
Project planning meetings	X	X	X	X																	
Sampling & Analysis Plan (SAP) development	X	X	X																		
QAPP development / obtain QAPP approval	X	X	X																		
Discussion with agency representatives	X	X	X																		
Survey training, scheduling, preparation, preparation and coordination			X	X											X	X					
Field reconnaissance (visits for station, logistics, etc.)				X																	
Field surveys, sampling and field audit(s)					X												X				
Data entry of water quality field data and laboratory results					X	X	X										X	X	X		
Water quality data review, validation and verification					X	X	X	X									X	X	X	X	
Report production for draft and final project technical memoranda and assessment reports					X	X	X	X	X								X	X	X	X	X

QUALITY ASSURANCE PROJECT PLAN

for

Brockton Receiving Water Assessment SEP Study

Prepared by: CDM
One Cambridge Place, 50 Hampshire Street, Cambridge, MA 02139
Ian Mead, CDM Project Manager

Date Prepared: DRAFT May 27, 2010

APPROVED BY:

Project Officer:

Ian Mead, CDM Project Manager _____ Date: _____
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Tel: 1-401-751-5360, Fax: 1-401-751-5499

Project Quality Assurance Officer:

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CDM, 50 Hampshire Street, Cambridge, MA 02139
Tel/Fax: 1-617-452-6238

City of Brockton Study Manager:

Michael Thoreson, Study Manager _____ Date: _____
DPW Commissioner
45 School Street – Third Floor
Brockton, MA 02301

United States Environmental Protection Agency (USEPA) Quality Assurance Officer:

David Pincumbe, QA Officer _____ Date: _____
USEPA, 5 Post Office Square, Mail Code: OEP06-1, Boston, MA 02109-3912
Tel: 1-617-918-1695

Massachusetts Department of Environmental Protection (MADEP) Technical Reviewer:

Jack Hamm, Technical Reviewer _____ Date: _____
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Tel: 1-617-292-5883

QAPP Distribution List

The following individuals shall receive copies of the approved QAPP and any subsequent revisions:

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Section 2 – Data Generation and Acquisition

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Acronyms and Abbreviations

AWRF	Advanced Water Reclamation Facility
ASTM	American Society of Testing and Materials
BL	Blank
BOD	Biochemical Oxygen Demand
cfs	Cubic feet per second
COC	Chain-of-Custody
DO	Dissolved Oxygen
DQOs	Data Quality Objectives
Dup	Duplicate
EDD	Electronic Data Deliverables
GLPs	Good laboratory procedures
IDW	Investigation-derived waste
IQR	Interquartile range
L	Liter
LCSDs	Laboratory Control Standard Duplicates
LCS	Laboratory Control Standard
MADEP	Massachusetts Department of Environmental Protection
MDLs	Method detection limits
MF	Membrane filtration
mg/L	Milligrams per liter
mL	Milliliter
MS	Matrix spikes
MSDs	Matrix spike duplicates
NOAA	National Oceanographic and Atmospheric Administration
N/A	Not applicable
NPDES	National Pollutant Discharge Elimination System
NWS	National Weather Service
PE	Performance evaluation
QA	Quality assurance

QA/QC	Quality assurance/ quality control
QAPP	Quality Assurance Project Plan
QC	Quality control
%R	Percent Recovery
RL	Reporting Limit
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SOD	Sediment Oxygen Demand
SOP	Standard Operating Procedure
STORET	Storage and Retreival Database
TBD	To be determined
TKN	Total Kjeldahl Nitrogen
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WRDA	Water Resource Development Act
WWTFs	Wastewater Treatment Facilities

Preface

This Quality Assurance Project Plan (QAPP) has been developed for the City of Brockton Advanced Water Reclamation Facility (AWRF) Comprehensive Receiving Water Assessment Supplemental Environmental Project (SEP). The City of Brockton entered a Consent Order requiring the SEP with the United States Environmental Protection Agency (USEPA) and the Commonwealth of Massachusetts Department of Environmental Protection (MADEP) on September 28, 2006 (U.S. District Court Case 1:06-cv-1134-NMG). The City of Brockton's contractor, Camp Dresser & McKee, Inc. (CDM) acts as the study manager and primary authority for this project. Although the USEPA and MADEP are not funding this project, both agencies have requested that this QAPP be developed in accordance with USEPA guidelines. As such, the document is based on USEPA's *QA/R-5: EPA Requirements for Quality Assurance Project Plans* (March 2001). This submittal is comprised of the following three components:

- Quality Assurance Project Plan (QAPP): Provides a summary of the project scope and objectives, defines the project quality objectives, methods for water quality and flow measurements and provides an overview of the field, analytical, and quality assurance/ quality control (QA/QC) activities
- Sampling and Analysis Plan: Describes the specific sampling criteria, locations, and frequency for water quality and flow measurements
- Standard Operating Procedure (SOP) Compendium: Compilation of SOPs detailing the specific sampling and laboratory procedures

Approval of this QAPP by USEPA and MADEP is required before the sampling program can begin. Copies of this QAPP will be provided to USEPA and MADEP for review and comment prior to initiation of the sampling program.

Section 1
Project Management

1.1 Project/Task Organization

1.1.1 Study Authority

The City of Brockton is required under Consent Decree (Civil Action Case No. 1:06-cv-11334-NMG, September 28, 2006) to perform a Comprehensive Receiving Water Assessment (the Assessment) Supplemental Environmental Project (SEP) consisting of two low-flow surveys of surface waters in the Taunton River Watershed. Low flow is defined as flows equal to the August median flow or lower. Pursuant to Appendix A of the Consent Decree, the Assessment includes chemical and biological sampling of approximately 10 stations, in locations from upstream of the Brockton discharge to the confluence of the Matfield and Town Rivers, including major tributaries. The chemical sampling includes **dissolved oxygen levels, pH, alkalinity, hardness, turbidity, conductivity, total dissolved solids, nitrogen series, chlorophyll-a, and total and dissolved orthophosphorus. The biological sampling may include macroinvertebrates and habitat assessment, fish community, periphyton (quantitative) and macrophytes (qualitative).** The Assessment is to be completed by March 31, 2012.

The SEP is funded by the City of Brockton and will be performed by its consultant Camp Dresser & McKee, Inc. (CDM). The City is required to expend a total of no more than $80,000 toward the cost of the assessment; therefore the project scope has been designed to meet this criterion. Pursuant to the SEP, the City is coordinating with EPA and the MassDEP in determining how the project funds will be best expended to meet the requirements of the Consent Decree.

The CDM Project Manager is responsible for overall study management, control, coordination, and implementation/completion.

This project was initiated to help provide an estimation of the impacts of recently completed upgrades to the Brockton Advanced Water Reclamation Facility (AWRF) on water quality and aquatic life in the surface waters of the Matfield River Subwatershed of the Taunton River Watershed.

1.1.2 Team Organization

The CDM Study Manager, Mr. Ian Mead, serves as the primary point of contact between CDM and its subcontractors (hereafter referred to as the CDM Project Team) and the City of Brockton Department of Public Works (DPW). The City of Brockton, in conjunction with the MassDEP, serve as the overall Study Management Team for the watershed study. The role of this Team is to provide general project guidance and ensure that work performed under this contract meets

the prescribed project scope. The Study Management Team will review proposed sampling locations and water quality constituents associated with the Sampling and Analysis Plan (SAP). All project deliverables will be reviewed by the Study Management Team. The Study Management Team will deliver the results of this monitoring program to MassDEP for use in support of decision making in the watershed.

The CDM Project Team will be comprised of CDM and its subcontractors, Biodrawversity and the Coastal Systems Program Analytical Facility at the University of Massachusetts (Dartmouth) School of Marine Science and Technology (SMAST).

Ms. Karen Kelley of CDM will serve as the Technical Project Manager for the field sampling program. Ms. Kelley will ensure that the work completed by the CDM Project Team meets the prescribed scope of work; she will be the primary point of contact between the CDM Project Team and the Study Management Team. Ms. Kelley will work closely with the Study Management Team to develop an effective sampling plan and solicit feedback regarding the proposed design. Ms. Kelley will also be responsible for coordinating the specific details of the data collection and review effort, such as:

- Making final go/no go decisions for sampling events
- Oversight of CDM Project Team mobilization during sampling events, including sampling crews from CDM and subconsultants
- Oversight of data reviews and preparation of technical memorandums
- Daily tracking of weather events and determination of low-flow conditions

Ms. Julie Gagen will serve as the Field Program Coordinator for CDM. She will be responsible for mobilizing, coordinating, and managing sampling teams from CDM in the field. Ms. Gagen will report directly to the Technical Project Manager. Mr. Gary Mercer will serve as CDM's Quality Assurance Officer; he will be responsible for ensuring that the data collected during the sampling program meets the quality objectives set forth in this Quality Assurance Project Plan (QAPP). Mr. Mercer is independent of the CDM Team members that will be working on the field sampling effort.

Mr. Ethan Nedeau will serve as the Field Program Coordinator for the subconsultant, Biodrawversity, LLC. He will be the primary point of contact for CDM. Mr. Nedeau will also be responsible for mobilizing, coordinating and managing his respective project teams during the field sampling effort.

During sampling events, the Field Program Coordinators, Ms. Kelley (CDM) and Mr. Nedeau (Biodrawversity) will be responsible for:

- Coordinating sampling efforts and equipment requirements within the CDM Project Team

- Identifying problems at the field team level
- Resolving difficulties in coordination with the Technical Project Manager
- Implementing and documenting corrective actions

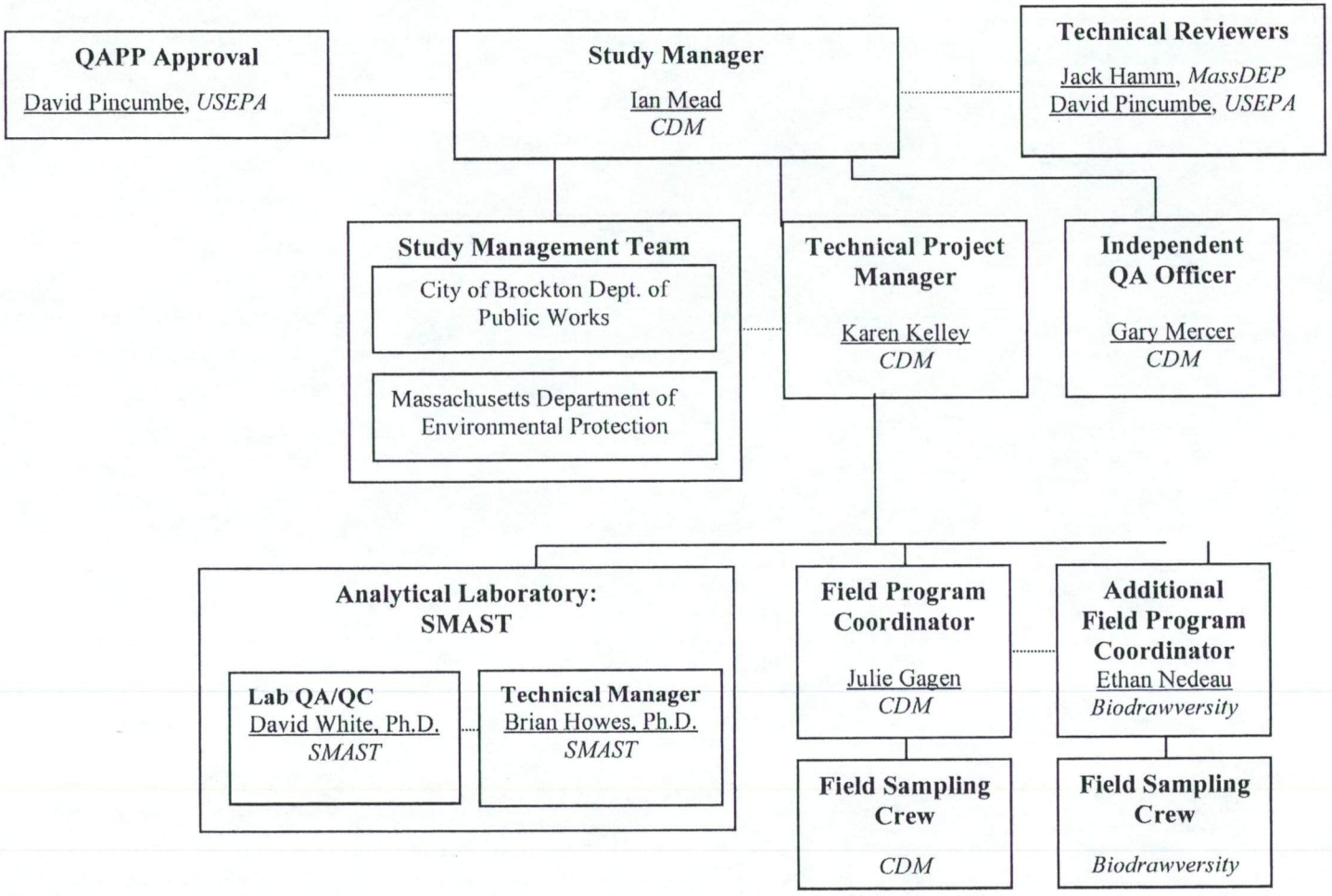
Field technical staff from CDM and Biodrawversity will be responsible for gathering and analyzing data in the field. They will report directly to their respective Field Program Coordinators.

Analytical laboratories have yet to be determined. Once selected, the laboratories will be responsible for analysis of water quality samples collected during this investigation. The contacts for the selected analytical laboratories will be identified and this information will be appended to this document once it becomes available. Each laboratory will have an assigned Quality Assurance Officer that is responsible for assuring that the Quality Assurance Plan for their respective laboratories is adhered to and that the quality assurance and quality control criteria stipulated in this QAPP is achieved and documented for all analyzed samples. Laboratory technical staff are responsible for sample analysis and identification of corrective action. Analytical results and quality assurance and control reports will be sent to CDM's Technical Project Manager. A summary of the parameters to be analyzed by the selected laboratories is provided in Table 2-5.

Mr. David Pincumbe serves as the approving authority for this QAPP for the USEPA. Mr. Pincumbe of the USEPA and Mr. Jack Hamm of MassDEP serve as the respective technical reviewers from each agency. Following the approval of this QAPP, Mr. Pincumbe and the technical reviewers will be kept abreast of the study progress once the sampling program begins.

A project organization chart is provided in Figure 1-1.

Figure 1-1: Project Organizational Chart



1.2 Problem Definition and Background

1.2.1 Study Background

This project was initiated to conduct the Comprehensive Receiving Water Assessment SEP on the surface waters of the Matfield River subwatershed of the Taunton River Watershed in compliance with the requirements of Appendix A of the Consent Decree in Civil Action Case No. 1:06-cv-11334-NMG. The Matfield River and its tributaries drain 77 square miles of the northeast portion of the Taunton River Watershed. This subwatershed contains some of the most densely developed areas of the state (land use in the western portion of the Matfield River subwatershed has impervious cover values greater than 25%). The Salisbury Plain River (MA62-06) and the Matfield River (MA62-32) waterbodies are listed on the Massachusetts Year 2004 Integrated List of Waters submitted to the USEPA in fulfillment of sections 305(b) (Summary of Water Quality) and 303(d) (List of Impaired Waters) of the Clean Water Act (CWA). Specifically these waterbodies were listed due to organic enrichment, low dissolved oxygen (DO), and pathogens. The Brockton AWRF discharges to the Salisbury Plain River at the upstream end of segment MA62-06.

The City of Brockton received funding through the 2003 State Revolving Fund (SRF) program to rehabilitate its aging collection system and its treatment facility. The project objective was to eliminate the environmental and public health issues associated with the sewer system overflows and discharge violations at the treatment facility. In 2004, the Brockton AWRF began a 3-phase facility-wide upgrade that was completed in 2009. The upgrade included advanced treatment processes such as biological nutrient removal (BNR) for total nitrogen reduction and multipoint chemical addition for total phosphorus reduction. The three phases of the upgrade were designed to increase the plant's design capacity from 18 mgd to 20.5 mgd, to enable the plant to meet tighter performance goals including a 0.2 mg/L effluent total phosphorus limit, and to replace almost all of the plant's process equipment, which had served beyond its expected service life.

- Phase 1 of the Brockton AWRF upgrade consisted of improvements to approximately 50-percent of the plant's aeration tank capacity and aeration blower capacity, and installation of a new lift station that allowed the plant to optimize its capacity in later phases. The aeration tanks that were upgraded had a targeted effluent total nitrogen concentration of 5.5 mg/L. This phase of improvements was substantially complete and operational in December 2006.

- Phase 2 addressed primarily three areas of the plant: (1) the effluent filtration process, (2) the secondary clarifiers and (3) the solids-processing area. All of the clarifier mechanisms were replaced. The effluent filtration process was expanded to a peak capacity of 60 mgd, and together with new chemical feed systems to aid in coagulation, enabled the plant to meet its effluent phosphorus limit. This phase of improvements was substantially complete and operational in March 2008.

- Phase 3 addressed most of the remaining areas of the plant, including preliminary and primary treatment, the remaining 50-percent of the aeration tank capacity, and disinfection. This phase of improvements was substantially complete and operational in November 2008.

Construction on a fourth phase is now currently underway. This phase will upgrade the facility's incinerator and will not impact effluent quality.

1.2.2 Study Purpose

The overall purpose of the Assessment is to provide data to help quantify water quality improvements as a result of the Brockton AWRF upgrades, and to supplement data collected during monitoring activities performed in the Taunton River Watershed in 2006 by the MassDEP Division of Watershed Management (DWM). Additionally the collected information could be used to support MassDEP decision making on designated uses in the Taunton River Watershed, such as Primary or Secondary Contact Recreation, and Aquatic Life.

1.2.3 Description of Existing Conditions

In 1996 and 2001, water quality surveys, fish toxics monitoring, and benthic macroinvertebrate analysis of the Taunton River Watershed were performed by MassDEP's DWM. Data from these surveys are available in appendices A - F of the Taunton River Watershed 2001 Water Quality Assessment Report (MassDEP 2005).

Due to the lack of instream biological data, most segments in the Matfield River subwatershed were not assessed in the 2001 Taunton River Water Quality Assessment Report (2001 WQAR report) for the Aquatic Life Use (Table 1-1). The Primary and Secondary Contact Recreation uses were impaired in the 2001 WQAR report due to elevated bacteria levels in most segments (MassDEP 2005).

The Matfield and Salisbury Plain River watersheds Non Point Source (NPS) Assessment study, conducted by ESS, Inc., was initiated in 2002 at the request of local and state stakeholders. The primary goals of the project were to identify sources of NPS pollution and recommend actions to protect and improve water quality. Many of the river and stream segments in the NPS study were found to have impaired water and habitat quality due to extensive development, a lack of stream-side vegetation, and minimal stormwater detention or other treatment (ESS 2003).

Due to the lack of instream biological data, most segments in the Matfield River subwatershed are not assessed for the Aquatic Life Use. Nevertheless, this use is identified with an Alert Status in most of these segments because of concerns over habitat degradation, sedimentation, channel alterations, elevated total phosphorus concentrations, and low dissolved oxygen/saturation concentrations. The Matfield River and portions of Salisbury Brook, and Salisbury Plain River are assessed as impaired for the Aquatic Life Use due to habitat degradation and impacted macroinvertebrate communities. Because of elevated bacteria levels, most segments are assessed as impaired for the Primary and Secondary Contact Recreation

uses. Objectionable conditions in some segments caused the Aesthetics use to be assessed as impaired (MassDEP 2005).

There are four minor National Pollutant Discharge Elimination System (NPDES) permitted facilities in this subwatershed and one major municipal wastewater discharge facility, the Brockton AWRF which receives wastewater from approximately 20 industrial users. Low dissolved oxygen/saturation and elevated total phosphorus concentrations instream were associated with the Brockton AWRF discharge prior to plant upgrades completed in 2009. Both acute and chronic toxicity in the effluent have been of historic concern regarding possible impacts to the Salisbury Plain and Matfield rivers.

Numerous federal, state and local agencies and non-profit groups have performed water quality monitoring in the Taunton River Watershed (MassDEP 2005a). A listing of these groups includes: United States Environmental Protection Agency (EPA), Army Corps of Engineers, United Stated Geological Survey (USGS), the Massachusetts Division of Fisheries and Wildlife, Massachusetts Division of Marine Fisheries, Massachusetts Coastal Zone Management, UMass Dartmouth School for Marine Science and Technology (SMAST), the Taunton River Watershed Alliance (TRWA), and Dr. Kevin Curry of the Bridgewater State College Watershed Access Lab (WAL). Additionally, five stream teams are on tributary streams (Forge River in Raynham, Matfield River in West Bridgewater, Nemasket River in Middleborough, Winnetuxet River in Halifax and Town River in Bridgewater) and one is on the mainstem of the river in Somerset. For a complete description of these groups' efforts, see the separate MassDEP document Taunton River Watershed 2001 Water Quality Assessment Report, available online at http://www.mass.gov/dep/water/resources/wqassess.htm.

Due to documented impairments from studies conducted in this subwatershed, a need to better characterize the water quality and sources of impairments was identified. The DWM performed monitoring activities in the Taunton River Watershed in 2006 pursuant to the Surface Water Monitoring & Assessment Program of 2005-2009 (MassDEP, 2006, CN 277.0). The 2006 surveys of the Taunton River Watershed focused on obtaining information (i.e., water quality, bacteria, and benthic macroinvertebrate populations) at a total of 24 river stations, including 7 locations in the Matfield River subwatershed and one location on the Taunton River just downstream of the confluence of the Town and Matfield Rivers (Table 1-1). Individual monitoring elements included water quality surveys conducted during the months of May, June, August, September, and October. Data from samples obtained from the area of interest for the 2006 Assessment have not yet been released by MassDEP.[1] Samples from the 2006 Assessment were analyzed for nutrients, dissolved oxygen and other field measurements, bacteria (fecal coliform and E. coli), and continuous temperature and dissolved oxygen monitoring with unattended metered probes was carried out. Macroinvertebrate sampling and habitat assessments were performed to assess the aquatic life use status for 305(b) reporting requirements. All river segments that were sampled were previously "not assessed" for the Aquatic Life use. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring

[1] CDM, 2010. Personal communication between Kimberly Groff, MassDEP, and Karen Kelley, CDM, May 3, 2010.

Protocols (RBPs). Periphyton assessments were performed consisting of an approximation of the algal coverage within the reach, and scrapes of various substrates within the riffle zone to obtain samples for taxonomic identification to genus.

Table 1-1: Locations of 2006 MADEP Sampling and Biological Monitoring

Taunton River Watershed – 2006 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
Salisbury Brook	Warren Ave., Brockton, MA (3)
Salisbury Brook	Otis Street, Brockton, MA (1,2,3,4,5,6)
Trout Brook	Court Street, Brockton, MA (3)
Trout Brook	Crescent Street (Route 27), Brockton, MA (1,2,3,4,5,6)
Salisbury Plain River	Sargent's Way (upstream from Brockton AWRF), Brockton, MA (1,2,3,4)
Salisbury Plain River	Matfield Street (downstream from Brockton AWRF), East Bridgewater, MA (1,2,3,4)
Salisbury Plain River	Downstream from Belmont Street, East Bridgewater, MA (5,6)
Beaver Brook	Crescent Street, Brockton, MA (1,2,3,4)
Beaver Brook	Downstream from Elm Street, East Bridgewater, MA (5)
Beaver Brook	Belmont Street, East Bridgewater, MA (3)
Meadow Brook	West Union Street, East Bridgewater, MA (1,2,3,4,5,6)
Satucket River	Plymouth Street, East Bridgewater, MA (1,2,3,4)
Satucket River	Downstream from Bridge Street, East Bridgewater, MA (5,7)
Matfield River	West Union Street, East Bridgewater, MA (1,2,3,5)
Matfield River	High Street, Bridgewater, MA (1,2,3,4)
Taunton River	Plymouth Street, Bridgewater, MA (1,2,3,4)
Taunton River	Green Street, Middleborough/Bridgewater, MA (1,2,3,4)
Taunton River	Downstream from Summer Street, Bridgewater/Middleborough, MA (7)
Taunton River	Old Colony, Taunton/Raynham, MA (1,2,3,4,7)
Canoe River	Willow Street, Foxborough, MA (1,2,3,4,5,6)
Rumford River	Coccasset Street, Foxborough, MA (1,2,3,4,5,6)
Rumford River	Willow Street, Mansfield, MA (1,2,3,4,5)
Rumford River	Pine Street, Norton, MA (1,2,3,4)
Wading River	Upstream from Balcolm Street, Mansfield, MA (5)
Wading River	West Street, Mansfield, MA (1,2,3,4)
Wading River	Route 123 (near Norton C.C.), Norton, MA (1,2,3)
Wading River	Route 140, Norton, MA (1,2,3,4,5)
Threemile River	Harvey Street, Taunton, MA (downstream of Mansfield POTW) (1,2,3,4,5)
Threemile River	Cohannet Street/Route 44, Taunton, MA (1,2,3,4)

*1 – Attended multi-probe (DO, temperature, pH, conductance)
2 – chem/nutrients
3 – bacteria
4 – unattended continuous dissolved oxygen and temperature
5 – Macroinvertebrate Rapid Bioassessment Protocol (RBP) III and habitat assessment
6 – periphyton
7 – Macroinvertebrate multiplate samplers

1.3 Task Description

A comprehensive water quality sampling and biological assessment program will be completed within the $80,000 upper limit under the Consent Decree. The overall goal of the field sampling program is to assess the current water quality, biological, and habitat conditions at specific sampling stations during summer low flow conditions within the Salisbury Plain River and Matfield River and tributaries from upstream of the Brockton AWRF discharge to the Taunton River at the confluence of the Matfield and Town Rivers in Bridgewater. Low flows will be defined as flows equal to the August median flow or lower.

Chemical sampling will occur upstream of the Brockton AWRF, upstream and downstream on the mainstem river, and in major tributary locations located within the sampling area. Separately, biological monitoring will be conducted at selected locations to perform macroinvertebrate and habitat assessments, fish community, and periphyton and macrophytes assessments within the project budget.

Each round of the sampling will include confirmation of sampling locations, compilation of precipitation and streamflow data, and approximately five days of field work for one 4-5 person team, in-house laboratory work for macroinvertebrate identification to family/genus, compilation of all sampling and analysis, and a "Field Completion Memo" summarizing the procedures and results.

The Assessment tasks will include:

- Task 1: Water Quality Sampling Program Design
- Task 2: Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) Preparation
- Task 3: 2010 Chemical Sampling and Biological Surveys
- Task 4: 2011 Chemical Sampling and Biological Surveys
- Task 5: Reporting

The primary purpose of Task 1 is to clarify program objectives and select sampling locations. This information will be used to finalize the water quality Sampling and Analysis Plan (SAP) submitted with this QAPP (Task 2). Subsequent to the chemical sampling and biological surveys intended for completion in 2010 and 2011 (Tasks 3 and 4, respectively), the output from the Assessment will be a SEP Completion Report (Task 5) summarizing the current water quality and aquatic life and habitat conditions in the Taunton River watershed.

The environmental data collected under this task will be usable for implementation of DEP 305(b) water body health assessments and TMDL development for impaired waters.

The field sampling program will be comprised of the following five major subtasks:

- Chemical water quality surveys (dissolved oxygen levels, pH, alkalinity, hardness, turbidity, conductivity, total dissolved solids, nitrogen series, chlorophyll-a, and total and dissolved orthophosphorus)
- Macroinvertebrate and habitat assessment
- Fish community study
- Periphyton assessment (analysis of microalgae, bacteria, and/or fungi on submerged substrates)
- Macrophyte assessment (qualitative analysis of vegetation at the sampling site)

A brief description of each component of the sampling program is provided in the sections below, along with a description of the Study Area. Additional detail regarding the specific water quality parameters to be analyzed during the low flow surveys and a preliminary list of sampling locations are provide in the Sampling and Analysis Plan (to be submitted under separate cover). In addition to data collected directly by the CDM Project Team, precipitation and streamflow data reported by the National Oceanographic and Atmospheric Administration (NOAA) weather station in Taunton, Massachusetts (http://www.erh.noaa.gov/box/dailystns.shtml) and USGS streamflow monitoring gage 01108000 on the Taunton River for the period of five days prior to sampling will be submitted to the MassDEP in Field Completion Memos.

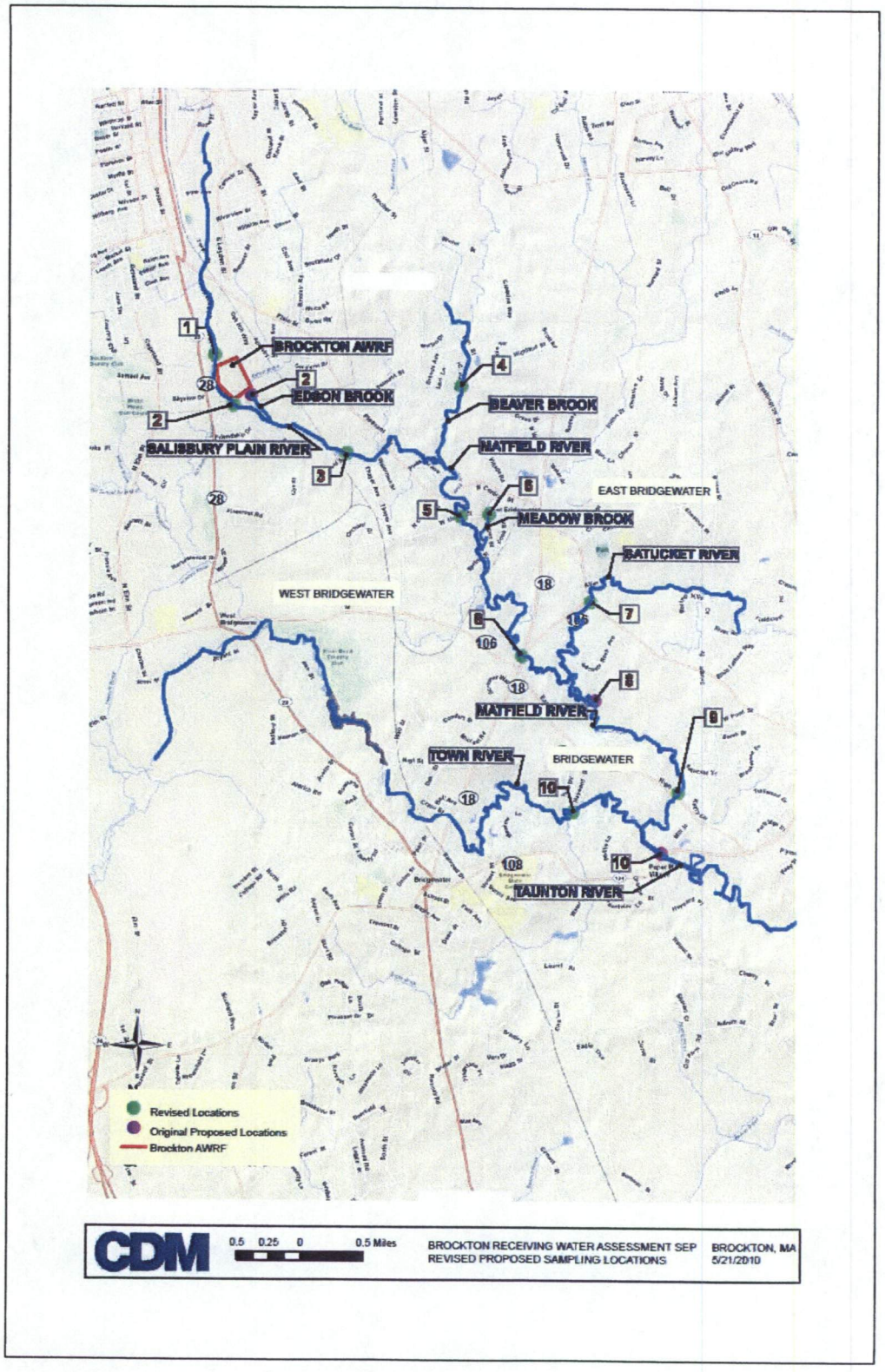
The formal deliverables of this sampling program will be a database of water quality measurements collected during summer low flow sampling surveys and two Field Completion Memoranda summarizing the chemical water quality and biological data. Following completion of the sampling program and field completion memos, documentation of the Assessment will be submitted in a SEP Completion Report by March 31, 2012, as stipulated in the SEP.

1.3.1 Study Area

For the purposes of the field sampling program, the Study Area has been defined as the tributaries and mainstem river of the Salisbury Plain and Matfield River subwatersheds of the Taunton River Watershed from upgradient of the Brockton AWRF to the confluence of the Matfield and Town Rivers.

Figure 1-2 shows the Study Area that will be targeted by this sampling program. A more detailed description of the Study Area is provided in the "*Taunton River Watershed Water Quality Assessment Report*," completed in 2005 by MassDEP.

Figure 1-2: Study Area



1.3.2 Low Flow Surveys

Two summer low flow surveys are scheduled as part of this sampling program, which will include both chemical sampling and biological monitoring; specific details regarding sampling stations and sampling matrices are provided in the Sampling and Analysis Plan, submitted under separate cover. The surveys will be performed in August 2010 and 2011, the periods most likely to exhibit typical low flow conditions.

A preliminary list of sampling sites has been prepared, which includes up to 10 survey locations (Figure 1-2). This sampling regime may be adjusted prior to implementing the field sampling due to budgetary reasons and/or accessibility. All locations will be confirmed and finalized during a stream survey that will be conducted prior to actual field sampling. In addition to surveys performed on the mainstem of Salisbury Plain and Matfield Rivers, surveys will be performed in the major tributaries, and upstream of the Brockton AWRF.

Additional information on the sampling locations and water quality parameters for the summer low flow sampling events is provided in Section 2.1.1 of the QAPP and in the Sampling and Analysis Plan.

1.4 Quality Objectives and Criteria

Environmental data and streamflow measurements to be collected by the CDM Project Team in support of the Brockton Receiving Water Assessment SEP will meet the quality objectives outlined in this section. The specific quality assurance objectives and the measurement performance criteria will serve as the basis for the Sampling and Analysis Plan. This section provides overall guidelines as to the minimum requirements for quality control, whereas the Sampling and Analysis Plan presents detailed information on locations, methods, and frequencies for environmental measurements and sample collection.

1.4.1 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data required to support defensible decisions relating to specific environmental problems. DQOs are based on the end uses of the data to be collected; as such, different data uses may require different type and level of data quality. The data collection and analysis procedures will therefore be designed to meet the most stringent DQOs.

The following DQOs have been developed for the Brockton Receiving Water Assessment SEP:

- Collect water quality and biological/habitat data to characterize the impacts of improvements to the Brockton AWRF on the river.
- Collect water quality data to determine the relative likelihood that segments of the mainstem Salisbury Plain and Matfield Rivers meet state water quality standards

These objectives were used to select sampling locations, as well as suitable sampling methods, measurement techniques, and analytical protocols with the appropriate quality assurance and quality control guidelines.

State Water Quality Standards

The Commonwealth of Massachusetts categorizes waters according to their use class. Each class is associated with a series of designated uses; the ability of a waterbody to support these uses is assessed based on its ability to meet the applicable water quality standards. Massachusetts designated use categories include aquatic life, fish consumption, drinking water, shellfish harvesting, primary contact recreation (swimming), secondary contact recreation (fishing and boating), aesthetics, and agricultural and industrial.

The Salisbury Plain and Matfield Rivers in the study area are classified as Class B Warm Water fisheries. Appendix B provides a summary of the Massachusetts Surface Water Quality Standards at 314 CMR 4.00. These standards will be used to assess the likely compliance/non-compliance status of the mainstem Salisbury Plain and Matfield Rivers per the second DQO.

1.4.2 Measurement Performance Criteria

Measurement performance criteria, including the accuracy, precision, completeness, comparability, and representativeness of the data, will be used to assess the quality of all environmental measurements in relation to the DQOs. In order to meet the quality assurance objectives, the data must be (1) of known quantitative statistical significance in terms of accuracy and precision; (2) representative of the actual site in terms of physical and chemical conditions; (3) complete to the extent that necessary conclusions may be reached; and (4) comparable to previous and subsequent data collected. Both field and laboratory quality objectives are addressed in each section.

Accuracy

Accuracy is defined as the extent of agreement between an observed value (*i.e.* sample result) and the accepted, or true, value of the parameter being measured. Accuracy is quantitative and is usually expressed as the percent recovery (%R) of a sample result as indicated below:

$$\%R = \frac{(A - B) * 100}{C}$$

where A= Analyte concentration determined experimentally with known quantity of reference material added
B= Background determined by separate analysis of sample or, in the field, a blank
C= True value of reference standard added

Laboratory Accuracy Objectives. Laboratory accuracy is assessed though the use of known standards, such as Laboratory Control Samples (LCS), and matrix and analytical spikes.

Accuracy within the laboratory is expressed in terms of percent recovery (%R). Specific laboratory accuracy requirements are discussed in the applicable analytical SOP and/or laboratory Quality Assurance Plan. Accuracy goals with acceptance limits for applicable analytical methods are provided in Table 1-2.

Table 1-2: Quality Assurance Precision and Accuracy Objectives for Laboratory Analytical Analyses

Parameter	Field Precision (%RPD)[1]	Laboratory Precision (%RPD)[1]	Accuracy (%R)[2]	Field Blank Cleanliness[3]
Total Phosphorus	≤30%	≤5%	95-105%	<RL
Orthophosphate	≤30%	≤5%	95-105%	<RL
Nitrate+Nitrite	≤30%	≤5%	95-105%	<RL
Ammonia-N	≤30%	≤5%	95-105%	<RL
Dissolved Organic Nitrogen (DON)	≤30%	≤20%	80-120%	<RL
Particulate Carbon/Nitrogen	≤30%	≤10%	90-110%	<RL
Alkalinity	≤30%	≤5%	95-105%	<RL
Chlorophyll-a	≤30%	≤10%	90-110%	<RL
DO (Winkler titration)	N/A	10%	N/A	N/A

[1]%RPD= Relative Percent Difference; [2]%R= Percent Recovery; [3]RL= Reporting Limit; [4]N/A= Not Applicable

Field Accuracy Objectives. The accuracy of multi-probe measurements taken in the field, including DO/temperature measurements, will be assessed by using measurement equipment calibrated at a frequency interval set to maintain field accuracy goals. Multi-probe measurements will be tested prior to use using standard solutions that bracket the measurement range and after use checked against standards to determine if the probes remained in calibration at the end of the measurement period. A NIST-certified thermometer is used to periodically check thermometer accuracy. The post-sampling checks of each unit ensure that the readings taken during the survey(s) were within QC acceptance limits for each multi-probe analyte.

Accuracy of water quality sample collection activities will be assessed using field blanks and by adherence to all sample handling, preservation, and holding times. Field blanks consisting of distilled, deionized water will be submitted blindly to the analytical laboratories at a minimum rate of ten percent, or one blank per survey or one blank per 10 samples collected, whichever is greater. Field blank cleanliness requirements are provided in Table 1-2.

Equipment blanks will be collected at a minimum rate of ten percent, or one blank per survey or one blank per 10 samples collected, whichever is greater, where sampling equipment is used to

collect a grab sample (*e.g.*, a Van Dorn sampler) and samples are not collected directly into the sample bottle. The equipment blanks will consist of rinsate samples from the sample collection equipment to determine if there is cross-contamination between sampling locations.

Additional information on the quality assurance procedures is provided in the applicable SOPs.

Precision

The precision of a measurement is the degree to which two or more measurements are in agreement. Precision is quantitative and is most often expressed in terms of Relative Percent Difference (RPD). RPD is calculated for each pair of duplicates as indicated below:

$$RPD = \frac{(S - D) * 100}{(S + D) \div 2}$$

where S= First sample value (original or matrix spike value)
D= Second sample value (duplicate or matrix spike duplicate value)

Laboratory Precision Objectives. Precision in the laboratory is determined by the comparison of laboratory generated duplicate samples, where duplicates result from an original sample that has been split for identical purposes. The precision is evaluated by determining the RPD of duplicate (replicate) analyses, as provided in the equation above. Specific laboratory precision requirements are discussed in the applicable analytical Standard Operating Procedure (SOP) and/or laboratory Quality Assurance Plan. Precision goals for each water quality parameter, as well as the acceptance limits for applicable analytical methods are provided in Table 1-2.

Field Precision Objectives. Field precision is assessed by the collection and analysis of duplicate samples in the field, which are not identified to the analytical laboratory. The results of the duplicate analyses are used to assess the degree of precision in the field samples. Field precision for samples analyzed in the laboratories will be assessed at the minimum rate of ten percent, or one duplicate for every 10 samples collected or one duplicate per sampling survey, whichever is greater. The RPD will be calculated per the above equation. Precision requirements for field duplicates are provided in Table 1-2.

The precision of *in-situ* measurements conducted using a multi-probe in the field will be assessed based on the reproducibility of multiple readings (via a second placement of the unit) readings at the same station location. Multi-probe precision objectives are < 10% RPD.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained for that measurement under normal conditions. Events that may result in a reduction in measurement completeness include sample breakage during shipment, inaccessibility to proposed sampling location, and sampling equipment errors.

Field Completeness Objectives. Field completeness is a measure of the amount of valid results obtained from the measurements made. The Sampling and Analysis Plan specifies the number of field and laboratory measurements to be made during the program. The completeness criterion for all *in situ* measurements (DO and temperature measurements) and analytical analyses is 90% (*i.e.* 90% of the planned samples must be collected and accepted for analysis). The completeness criterion for biological monitoring is 80%. That is, at most, biological assessment at one planned location out of five might be cancelled for some reason that could cause an incomplete data set with up to 20% of the planned-on data not obtained.

Laboratory Completeness Objectives. Laboratory completeness is a measure of the amount of valid measurements obtained from all the samples submitted by the CDM Project Team for each sampling activity. The laboratory completeness criterion is 95%.

Representativeness

Representativeness expresses the degree to which data accurately and precisely typify a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. One of the primary objectives of this field sampling program is to obtain water quality and biological data that is representative of conditions in the Study Area.

Measures to Ensure Representativeness of Field Data. Representativeness is dependent upon the proper design of the field sampling program. These performance criteria will be met by ensuring that the sampling protocols listed in the Sampling and Analysis Plan are followed. Additionally, the Sampling and Analysis Plan was developed considering the DQOs established herein and the appropriateness of sampling locations, sampling protocols, and water quality constituents. The sampling network designed and specified in the Sampling and Analysis Plan provides data representative of the Study Area for the expressed purposes of the water quality and biological assessment activities.

Measures to Ensure Representativeness of Laboratory Data. Representativeness in the laboratory is ensured by the use of proper analytical procedures, following "good laboratory practices" (GLPs), meeting sample holding times, and analyzing and assessing field duplicates. The selected analytical laboratories will have Quality Assurance Plans and will follow written SOPs for each analytical analysis.

Comparability

Comparability is an expression of the confidence with which one data set can be compared with another. Data collected in one segment of the Study Area may be compared to data from another area to allow for the relative comparison of water quality parameters between stations.

Measures to Ensure Comparability of Field Data. Comparability of data is assured by a properly designed field sampling program and is satisfied by following proper sampling protocols as outlined in the Sampling and Analysis Plan. For this program, data comparability

is assured by the use of identical sampling, measurement, analytical and data reporting methodologies in accordance with documented procedures.

In situ DO measurements will be compared to a limited number of Winkler Titration samples to assess the performance of the field probes. A comparability criterion of ±1.0 mg/L has been established for comparison between these two samples. *In situ* measurements falling outside this range will be either rejected or qualified accordingly.

Measures to Ensure Comparability of Laboratory Data. Comparable analytical data results from employing identical sampling and analytical methods as documented in this QAPP. Comparability of analytical data will be assessed under the supervision of the Technical Project Manager.

1.5 Special Training and Certification

This sampling program includes only standard field sampling techniques, field analyses, laboratory analyses, and data validation techniques. Specialized training is therefore not required. All field personnel on the CDM Project Team are experienced in the standard protocols for surface water sampling and flow monitoring using the equipment discussed in this QAPP and the associated Sampling and Analysis Plan.

A kick-off meeting will be conducted prior to the commencement of the field sampling program to brief members of the CDM Project Team on the sampling procedures. Demonstration of sample collection techniques will be provided where appropriate. A background presentation will be given in the kick-off meeting that explains the project tasks and how the data collection fits into the overall program.

Individual certifications relevant to implementation of this plan are not required; however, sampling and field personnel will be asked to sign a Project Personnel Sign-Off Sheet to record their attendance at the kick-off meeting and formally acknowledge that they have been trained to carry out the relevant project tasks.

The selected analytical laboratories will be certified or approved by MassDEP to perform all analytical procedures that will be required during the completion of this field sampling program. All laboratory personnel are to have had training in accordance with the procedures outlined in their respective Quality Assurance (QA) Plans. A summary of the laboratory certifications and/or QA Plans for the selected laboratories will be appended to this document.

1.6 Documents and Records

This section of the QAPP describes how project data and information will be documented and tracked from its generation in the field to its final use and storage. This will ensure data integrity and defensibility.

1.6.1 QAPP Distribution and Version Control

CDM's QA Officer, Mr. Gary Mercer, will be responsible for distributing copies of the approved QAPP and any subsequent revisions to individuals on the Distribution List. In addition, CDM will maintain on file a complete copy of the original document and all revisions of the QAPP, including addenda and amendments.

CDM will use document control procedures to identify the most current version of the QAPP. Each revision will be differentiated with a new revision number and date. The following document control information is included in the top right-hand corner of each page in this QAPP:

- Title of the document (abbreviated)
- Revision number and document status (*i.e.* draft, interim, final)
- Date of original or current revision
- QAPP section
- Page number in relation to the total number of pages (in section)

A Project Personnel Sign-Off Sheet will be used to document that all members of the CDM Project Team (including subcontractors and laboratories) have read the QAPP and will perform the tasks as described. CDM's QA Officer will maintain the Sign-Off Sheet. The following information will be required:

- Project personnel name, title, contact number, and signature
- Date QAPP was reviewed
- QAPP acceptable as written (Yes/No)
- Date of Kick-off Meeting Attendance and Review of Procedures (Field Personnel Only)

1.6.2 Data Reporting and Retention

Proper documentation of field and laboratory activities is essential for the attainment of the DQOs outlined for this study. Data reporting is the detailed description of the data deliverables used to completely document the calibration, analysis, quality control measures, and calculations. Data acquired in the field will be reported after reduction and validation by the responsible technical staff. Data from laboratory analyses will be reported after the data are reviewed, assessed for quality assurance, and the data usability is assessed based on guidance provided in subsequent sections of this QAPP. Preliminary data will not be released as a part of this study. All data will be validated prior to distribution.

Project Documentation and Records

CDM will maintain a Final Evidence File, which will be the central repository for all documents that constitute evidence relevant to sampling and analysis activities as described in this QAPP and associated Sampling and Analysis Plan. Table 1-3 presents a summary of sample collection records, field analysis records, laboratory records, and data assessment records that will be contained in the file.

Table 1-3: Project Documents and Records

Sample Collection and Field Analysis Records	Laboratory Records	Data Assessment Records
• Field logbooks • Field data collection and analysis forms • Chain-of-custody (COC) records • Telephone and e-mail correspondence logs • Corrective action reports • Field quality control (QC) checks and QC sample records • *In situ* measurement calibration, inspection, and maintenance logs • Field photographs • Copy of QAPP and Sampling and Analysis Plan	• COC Records • Sample receipt/ tracking forms • Preparation and analysis forms/ logbooks • Data summary reports • Corrective action reports • QC checks and QC sample results	• Field analytical audit checklists and reports • Fixed laboratory audit checklists and reports • Data validation reports • Telephone and email correspondence logs • Corrective action reports • Progress reports • Interim progress reports and final reports

CDM's administrative staff will have the responsibility of implementing and maintaining a document control system, which includes a document inventory procedure and filing system. All members of the CDM Project Team will be responsible for project documents in their possession while working on a particular task. CDM's official policy on document retention dictates that a copy of all final project reports, final planning documents, and computer models, output, and results are permanently archived following the closure of a project. All other files, including field and laboratory data, are generally kept for a period of 10 to 20 years.

Electronic copies of all project files and deliverables, such as electronic databases, will be routinely backed-up and archived. The Technical Memorandum to be prepared at the conclusion of the field sampling program will be submitted to the MassDEP as hard copies and

on CD in electronic text in Microsoft Word XP. All data, reports, and materials obtained and/or created under this task will be turned over to the Contracting Officer at the completion of the contract to become property of the City of Brockton.

Field Analysis Data Package Deliverables and Reporting Formats

The Field Analysis Data Package Deliverables will include the list of items provided in Table 1-4 under "*Sample Collection and Field Analysis Records.*" Field crews will be instructed to document all activities associated with site visits and sampling efforts, including unusual and anomalous conditions, which will be used during data interpretation and analyses. All documentation will require input in standardized data collection forms developed specifically for the Brockton Receiving Water Assessment SEP, or in field logbooks.

Field Data Collection Forms. Field data collection forms will be used to document sample collection activities, flow measurements, and sample compositing procedures; they include:

- Water Quality Sample Collection Sheets
  - Including grab sampling forms; *in situ* temperature, pH, DO, and conductivity measurements; stage height; and QA samples collected
- Temperature/DO Measurement Sheet
- Diurnal DO Measurement Sheet
- Biological Monitoring Field Sheets

Example worksheets are provided in the Sampling and Analysis Plan.

Field Logbooks. Field logbooks will be used to document all investigation and data collection activities performed at the site that are not covered by the aforementioned standard forms. The logbooks will be permanently bound and paginated prior to the initial entry for the purpose of identifying missing pages after completion. Logbooks will be maintained by members of the CDM Project Team in accordance with SOP-DOC-001, "Field Logbook Content and Control."

Laboratory Data Reporting Package and Reporting Formats

The Laboratory Analysis Data Package Deliverables will be provided in a "CLP-like" format. This includes, but is not limited, the following as appropriate for the respective analyses:

- Chain-of-custody (COC) Forms (signed)
- Sample Receipt Log-in and Checklist Forms
- Case Narrative

- Analytical Results (including time, date, and appropriate qualifiers)
- Initial and Continuing Calibration Results
- Method Blank Results and Raw Data
- Sample Matrix Spike/Matrix Spike Duplicate Results and Raw Data
- Laboratory Control Sample Results and Raw Data
- Laboratory Duplicate Results and Raw Data

Final laboratory data reports will be issued to the CDM Project Team's Technical Project Manager within ten to 28 days of the sample receipt, depending on the laboratory. Electronic data deliverables will also be provided.